



NOAA-20 OMPS OZONE PRODUCTS

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with contributions from members of the SDR and EDR teams
at NOAA, NASA and Raytheon**

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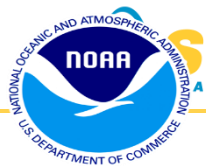
Ozone Cal/Val/Alg Team Membership

	Name	Organization	Task
Lead	Lawrence Flynn	NOAA/NESDIS/STAR	Ozone EDR Team
Sub-Lead	Irina Petropavlovskikh	NOAA/ESRL/CIRES	Ground-based Validation
Sub-Lead	Craig Long	NOAA/NWS/NCEP	Product Application
Sub-Lead	Trevor Beck	NOAA/NESDIS/STAR	Trace Gas Algorithm Development
Member	Jianguo Niu	STAR/IMSG/SRG	Algorithm development, trouble shooting, Limb Profiler science
Member	Eric Beach	STAR/IMSG	Validation, ICVS/Monitoring, Data management
Member	Zhihua Zhang	STAR/IMSG	V8 Algorithms implementation and modification
JAM	Laura Dunlap	JPSS/Aerospace	Coordination
Adjunct	Bigyani Das	STAR/AIT	Deliveries
PAL	Vaishali Kapoor	OSDPD	Atmospheric Chemistry Product Area Lead

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Algorithm Status and Approach V8TOz

- The Version 8 total ozone algorithm (V8TOz) and Linear Fit SO₂ (LFSO₂) algorithm were developed by NASA Ozone Science Team. Versions of the total ozone algorithm have been in use at NOAA for operational processing of SBUV/2 and GOME-2 measurements.
- The V8TOz is implemented on a granule processing to create EDRs. The algorithm combines radiance/irradiance ratios at 12 channels with climatological information and radiative transfer tables for standard ozone profiles to compute estimates of total column ozone, effective reflectivity and aerosols.
- The LFSO₂ algorithm uses the measurement residuals from the V8TOz retrievals to estimate the SO₂ using three sensitive channels and adjusts the final ozone estimate for the SO₂ absorption interference effects.
- The algorithms use the OMPS NM SDR and GEO products, climatological ancillary data, and radiative transfer look-up tables. We expect to refine the ancillary data in the future, e.g., use daily snow/ice tiles in place of climatology.
- The algorithms use a set of soft calibration adjustments that are updated infrequently.
- The EDR consists of a NetCDF file containing estimates of the total column ozone and SO₂, effective reflectivity and UV absorbing aerosols and error flags, measurement residuals and retrieval sensitivities from the algorithm.



Algorithm Status and Approach V8Pro

- NASA developed the Version 8 nadir ozone profile algorithm (V8Pro) over ten years ago. It has been in use for the NOAA SBUV/2 and OMPS programs.
- The V8Pro is implemented on granule processing to create an EDR. The algorithm combines radiance/irradiance ratios at 12 channels with climatological information and radiative transfer tables for standard ozone profiles to compute maximum likelihood estimates of ozone vertical profiles and effective reflectivity.
- The algorithm uses the OMPS NM and NP SDR and GEO products, climatological ancillary data, and radiative transfer look-up tables. We expect to refine the ancillary data in the future, e.g., use daily snow/ice tiles in place of climatology.
- The algorithm uses a set of soft calibration adjustments that are updated infrequently.
- The EDR consists of a NetCDF file containing estimates of vertical ozone profile, total column ozone and effective reflectivity and error flags, a priori profiles, averaging kernels, measurement residuals and retrieval sensitivities from the algorithm.

- Product performance requirements from JPSS L1RD supplement (threshold) versus observed/provisional maturity

Attribute	Threshold	NOAA-20 Observed/validated
Geographic coverage	90% Daily Global Earth	SWA < 70°
Vertical Coverage	0-60 km	0-60 km (RT tables, physics)
Vertical Cell Size	NA	NA
Horizontal Cell Size	50x50 km ² at nadir	50x17 km ² at nadir
Mapping Uncertainty	5 km at nadir	3 km at nadir (SDR Team)
Measurement Range	50 – 650 DU	90-700 DU (SDR range and past algorithm performance)
Measurement Accuracy		
X < 250 DU	9.5 DU	0 to -5 DU, vs. NPP
250 DU < X < 450 DU	13.0 DU	0 to -5 DU, vs. NPP
X > 450 DU	16.0 DU	Insufficient data
Measurement Precision		
X < 250 DU	6.0 DU	2.3 DU RMSDD, 6.0 DU NPPMU
250 DU < X < 450 DU	7.7 DU	2.0 DU RMSDD, 6.0 DU NPPMU
X > 450 DU	2.8 DU + 1.1%	Insufficient data

- Product performance requirements from JPSS L1RD supplement (threshold) versus observed/beta maturity

Attribute	Threshold	NOAA-20 Observed/validated
Geographic coverage	60% Global Earth 7 days	SZA < 86°, orbital track
Vertical Coverage	0-60 km	0-60 km
Vertical Cell Size	3-km reporting, 7-20 km	21 layers, averaging kernel
Horizontal Cell Size	250x250 km ²	250x50 km ²
Mapping Uncertainty	25 km	5 km
Measurement Range	0.1-15 ppmv	0.1-15 ppmv
Measurement Accuracy		At Beta
h < 25 km	10%	
25 km < h < 50 km	5-10%	
h > 50 km	10%	
Measurement Precision		At Beta
h < 25 km	20%	
25 km < h < 50 km	5-10%	
h > 50 km	10%	

Current NOAA-20 OMPS Issues and Concerns

Identified Concern/Issue	Description	Impact	Action/Mitigation and Schedule
NDE Table Updates	Soft Calibration adjustment tables will be updated as SDRs mature. We do not know how long this process will take.	Delays in reaching validated maturity	Identify a process for NDE similar to the “Fast Track” table approach at IDPS.
NDE Code Updates	Codes to reduce the effects of noise and outliers are being developed. These improvement will enter the queue for implementation at NDE.	Delays in reaching validated maturity for Medium FOVs	Should be delta deliveries as only 30 lines of code in one subroutine and one new data set will be added.
Change in OMPS NM Sample Table	There is a sub-optimal match in the CCD pixels for the OMPS-TC and OMPS-NP sample tables. There is a report on this issue, DR_8617, “FOV Mismatch between N20-OMPS-TC and N20-OMPS-NP”.	New SDR tables and EDR soft calibration adjustments are under development.	This work will delay when the EDR products will achieve validated maturity.
Discretization Error	The NOAA-20 OMPS-NP non-linearity correction is causing a discretization error for low signal levels. The error is causing a signal level dependent 2% error at shorter channels. The error can be removed by uploading a new non-linearity table to the NOAA-20 and updating the calibration coefficient file in the IDPS. DR_8730 was opened on this topic.	This will require a new flight nonlinearity table upload. It will have a positive impact on the SDR and EDR performance when completed.	Little impact on EDR product validation and development as errors from this effect are well-characterized.

Future Plans and Improvements

- We are implementing methods to reduce the effects of transient signals in the medium resolution NOAA-20 OMPS NM and NP SDRs on the V8TOz and V8Pro EDRs. The approaches under development for V8TOz use representations with a limited set of Empirical Orthogonal Function Patterns. The approaches under development for V8Pro use polynomial fits of radiance irradiance ratios of wavelength intervals around the algorithm channels to identify and remove outliers and to provide estimates at the selected wavelengths with reduced noise. [See talk in OMPS SDR Splinter.](#)
- The NOAA-20 OMPS NM will convert to full medium resolution processing (17x17 km² at nadir) sometime in 2019.
- The S-NPP OMPS Limb Ozone Profile product is in testing at the development area at NDE. The Limb Profiler will return with JPSS-2.
- NASA has developed an algorithm to generate UV cloud optical centroids. These measurement-based values can be used to replace the current climatological cloud top pressure.
- S-NPP OMPS SDR and EDR reprocessing will take place as resources allow.

- Additional information is available in the OMPS V8TOz and V8Pro algorithm theoretical basis documents (ATBDs) and the SDR beta maturity review briefing, which can be accessed at:

<https://www.star.nesdis.noaa.gov/jpss/Docs.php>

<https://www.star.nesdis.noaa.gov/jpss/AlgorithmMaturity.php>

- Provisional NOAA-20 OMPS SDR near-real-time status and performance monitoring web page will become available at the open website:

- <https://www.star.nesdis.noaa.gov/icvs/index.php>

- Pre-operational NOAA-20 OMPS EDR near-real-time status and performance monitoring web pages will become available at the following websites:

<http://www.ospo.noaa.gov/http://www.ospo.noaa.gov/Products/atmosphere/index.html>

<https://www.star.nesdis.noaa.gov/smcd/spb/OMPSDemo/proOMPSbeta.php>

https://www.star.nesdis.noaa.gov/jpss/EDRs/products_ozone.php

<https://ozoneaq.gsfc.nasa.gov/omps/n20/activity>

- Products will become available at the CLASS website:

https://www.class.ncdc.noaa.gov/saa/products/search?datatype_family=JPSS_OZONE

Summary

- The NOAA-20 OMPS instruments are performing well.
- The SDR team has identified improvements on the path to validated maturity.
- The EDR team will be providing soft calibration adjustments in communication with the SDR team and BUFR product users.
- Approaches to improve performance for the higher spatial resolution EDRs are progressing well.